Utilization of Precision Optical Measurement of Individual Photons Subject to Known Influences to Evaluate Any Segment of Pi Number Without Need to Calculate Previous Numbers

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Introduction

Although hyper-precise knowledge of Pi lacks in practical usefulness, Pi has, for many years, been an inspiration for innovation in the fields of mathematics and computer engineering.

Fundamental to the transcendental nature of the number is the infinite variability of possible geometric relationships between a straight line (radius) and the curved line that is circumference. Whether we use decimal math or math based upon any other system of numbers e.g. base 8, base 6, etc., the fact that rational numbers are being used creates a conflict between the smoothly curving nature of a geometric curvature (seen from a progressively closer viewpoint) and a straight line.

When we compute Pi in the manner we have for many decades using computers and mathematics, to put it poetically, we have been attempting to build a representative sculpture of a circle using Lego blocks. We can increase the number of blocks used until the number is incomprehensibly large, but if one were to look closely at this circle made from blocks, one would still be able to see that it is made of blocks. A circle made from blocks can never be a true circle. Pi, when calculated using rational numbers and mathematics, can never reach an end. The resultant numbers will always need to be rounded off. Despite this, no one has ever attempted to use an approach not dependent upon recursive calculation of previously computed numbers in order to find subsequent values. Using conventional methods to compute Pi, one must always start from the beginning in order to obtain accurate results for the millionth, billionth, trillionth, or quadrillionth digit. Furthermore, strings from forward positions in the number cannot mathematically enable the computation of subsequent numbers without knowledge of all preceding numbers. This is why large quantities of RAM are required and why calculations cannot simply "pick up where they left off from" when future record attempts are made.

Abstract

In a photonic angular momentum-metric physics-based approach to assessing Pi, the aforementioned limitations would essentially go out the window. In this new approach, *the only limitation on precision would be the accuracy of calibration and sensitivity of the equipment used.* Importantly, it would enable one to skip over large sections of the overall number, if they like, to arrive any number in the

sequence which falls within the technical limitations of the optical equipment/sensors used.

Unlike Pi, physical field effects proportional to distance are precisely understood through inverse square laws. If magnetic field A has effect X on photon B, then a magnetic field of half of that strength will have a proportionally lesser effect. If a magnetic field can be made to cause a photon to follow (as perfectly as possible) a geometric path (a circle being one such possible path) then the strength of the field required to bring this behavior about can, when compared with the detected sensor strikes of other photons subjected to proportionally weaker fields, be used to extrapolate any digit of Pi one likes.

It is, therefore, possible to construct an optical mechanism in which angular deviation of a photon bouncing within a vacuum between two perfect mirrors in the presence of a source of magnetism (of *finely* controllable strength) activated only during the primary passage of that photon near the source of that magnetism is indirectly measured by utilizing a sophisticated detector to measure the angle of deviation of the photon over a given distance. Repeated bounces between a pair of ultra-smooth mirrors could enable the differentiation of extremely subtle variations in angular momentum.

Crucial is finding a baseline of angular deviation correlating with 360 degrees of deviation. As any magnetic source, for this experiment to work, would necessarily have to be a point source in which magnetic North is always oriented toward the photon. Although technically challenging, enticing a single photon to remain equidistant from a singular magnetic source is *possible.* If this can be achieved, the level of magnetism required for coaxing a photon into a stable orbit around a magnon can be determined.

If one can evaluate the level of magnetic energy to force a photon to orbit around a central source of magnetism in a perfect circle (a detector could be used to verify that a photon arrives within a "keyhole" after a long journey (or a virtual keyhole estimated using mirrors and many successive reflections) then one could program the same electromagnet to exert a level of force equal to, for instance, 1/1 Trillionth of the level of force required to force a photon to follow a circular path in order to infer the corresponding value of that decimal place. Once the baseline value needed to perform this feat is found, it is simply a question of measuring angular deviation relative to the attenuated power level and ensuring precision of control of the factors of magnetic field strength and photon proximity at time of passage as well as sensor precision and insulation against ambient magnetism as well as ensuring an atmospheric vacuum.

Conclusion

Although it would necessitate the construction of a purpose-built device, a device which utilizes fine control over magnetic field strength and measures the alteration of a photon's angular momentum by that field would enable any portion of Pi to be deduced from a single trigonometric function and raw sensor

outputs along with precise timing data. Although it would not suddenly transform Pi into a non-transcendental number, it would enable the knowledge of Pi going out to numbers of decimal places measured in the quintillions rather than trillions. It could be said that this is a more *naturalistic approach* to assessing Pi. It would transform Pi benchmarking from an endeavor which principally concerns mathematics and computing into one which is used to assess the progress of the science of optical sensing, quantum magnetism and quantum/precision timing, all of which will play a outsized role in the technology of the later part of the 21st Century.